

CHAPTER 2. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Introduction

This chapter describes and compares the alternatives considered for the Bozeman Municipal Watershed Project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., helicopter logging versus the use of skid trails) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (i.e., the amount of erosion caused by helicopter versus skidding).

Alternatives Considered in Detail

Changes Between the Draft EIS and the Final EIS

The Forest Service developed five alternatives for the DEIS, including the No Action and Proposed Action Alternatives, in response to issues raised by the public and agency specialists. Alternative 5 was identified as the DEIS Preferred Alternative. Another alternative was developed for the FEIS and is identified as Alternative 6, the FEIS Preferred Alternative. Alternative 4 was changed in the FEIS to include fewer acres of prescribed burning as further analysis indicated that the larger acreage could not be logistically and safely burned.

Alternative 1

No Action

Under the No Action alternative, current management plans would continue to guide management of the project area. No fuel reduction activities would be implemented.

Alternative 2

The Proposed Action

This alternative is a more detailed version of the proposed action presented to the public during scoping. An interdisciplinary team with specialties in hydrology, fisheries, wildlife, silviculture, ecology and wildland fuels convened with data layers for soils, vegetation, fuels and fire risk. The data layers were used in concert with watershed, fire

behavior and landscape dynamic models to identify the infrastructure, land base and environmental conditions of most concern. The proposed action alternative reflects the priority treatment areas and one treatment scenario that would address the purpose and need for actions. A more detailed description of the treatment prescription and implementation methods is in Appendix A.

The actions proposed in this alternative include:

- * Approximately 850 acres of burning in less dense stands is proposed.
- * Mechanical cutting and piling of young trees would occur on 1,150 acres. Mechanical thinning or hand methods would be used to implement this thinning.
- * Partial harvesting is proposed for about 2,200 acres. Ground based (23%), skyline (32%), and helicopter (45%) harvest systems would be used to implement this thinning.
- * Features common to Action Alternatives, mitigation and activities associated with the primary treatments is in this Chapter beginning on page 12.
- * This Alternative would require a project-specific Forest plan amendment to exempt the proposed fuel reduction treatment from meeting the Forest Plan visual quality objective (VQO) on the Gallatin Face (FP, pg. II-16) in units 12, 13, 22.

The location of proposed treatment units can be found on the Figure 2-1, Alternative 2 Map. Approximately 7.2 miles of temporary harvest road would need to be constructed and 3 miles of old road reopened. Approximately 468 acres of the partial harvesting would occur in the Gallatin Fringe Inventoried Roadless Area. Harvest in the Inventoried Roadless Area would be accomplished by helicopter and no roads would be built. The approximate duration of the proposed activities would be a 5-12 year timeframe.

Alternative 3

This alternative was designed to meet the purpose and need for action and achieve the desired future condition more aggressively than Alternative 2. Given the extent of and current condition of the municipal watershed, an issue was raised by agency specialists that the proposed action was not extensive enough to be effective toward meeting the purpose and need for action. Treating additional acres would more effectively reduce the potential extent of future crown fires resulting in less severe fires and fire behavior.

The mitigation or design features unique to this alternative includes the addition of approximately 2,300 treatment acres and the associated roading. There is additional burning and thinning of large trees. The logging method for the units proposed for thinning large trees is approximately 19% ground based, 31% skyline harvest and 44% helicopter harvest. A more detailed description of the treatment prescription and implementation methods is in Appendix A.

The actions proposed in this alternative include:

- * Approximately 1100 acres of burning in less dense stands is proposed.
- * Mechanical cutting and piling of young trees would occur on 1,150 acres.
- * Partial harvesting is proposed for about 3,900 acres. Ground based, skyline and helicopter harvest systems would be used to implement this thinning.

- * Features common to All Action Alternatives, mitigation and activities associated with the primary treatments is in this Chapter beginning on page 12.
- * This Alternative would require a project-specific Forest plan amendment to exempt the proposed fuel reduction treatment from meeting the Forest Plan visual quality objective (VQO) on the Gallatin Face (FP, pg. II-16) in proposed units 12, 13, 14, 15, 20, 22, 27, 28, 29, 30.
- * The alternative would not meet the Forest Plan standard for fisheries in Leverich Creek and would require a plan amendment.

The logging method for the units proposed for thinning large trees is approximately 19% ground based, 31% skyline harvest , 46% helicopter harvest, and 4% helicopter/cable.

For better viewing of the Maps go to

http://www.fs.fed.us/r1/gallatin/?page=projects/bozeman_watershed

**BOZEMAN CREEK MUNICIPAL WATERSHED PROJECT
ALTERNATIVE TWO TREATMENT UNITS**

Treatment Legend

- Partial Harvest
- Mechanical or Hand Thin
- Understory Burn in Timber Stand

Legend

- Stream
- Temporary Road
- Forest Road
- Paved Road
- Gallatin NF Boundary

City of Bozeman Lands

Bozeman Creek

Hyalite Creek

Langohr Campground

City of Bozeman Lands

0 kilometers 1
0 miles 1/2 1

T3S R5E T3S R6E

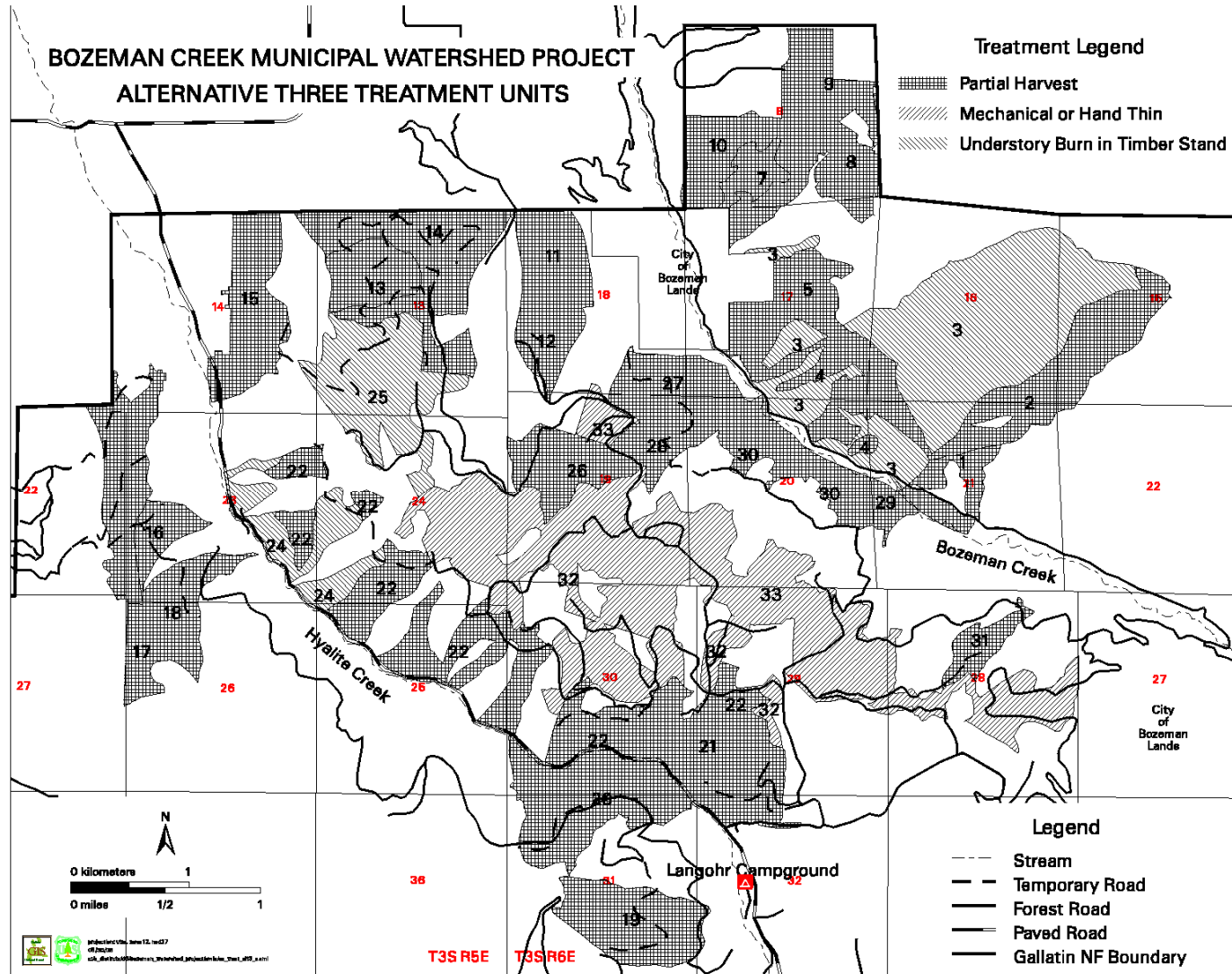
Alternative 3 (Continued)

For better viewing of the Map go to
http://www.fs.fed.us/r1/gallatin/?page=projects/bozeman_watershed

The location of treatment areas can be found on the Figure 2-2: Alternative 3 Map.

Approximately 13.5 miles of temporary road would need to be constructed and 5.4 miles of old road re-opened. Six hundred and seventy five acres of the partial harvesting would occur in the Gallatin Fringe Inventoried Roadless Area. Harvest in the Inventoried Roadless Area would be accomplished by helicopter and no roads would be built. The approximate duration of the proposed activities would be a 5-12 year timeframe.

Figure 2-2. Alternative 3 Map.



Alternative 4

The No Logging/Prescribed Burning Alternative

The mitigation or design feature unique to this alternative is that the design of treatments would be limited to prescribed burning, small tree removal and no additional roads. This alternative combines an effort to meet the purpose and need for action without thinning large trees using logging methods. This alternative is also the agency response to the request during scoping to consider an alternative limited only to prescribed burning and to consider an alternative with no additional roads. A more detailed description of the treatment prescription and implementation methods is in Appendix A.

The actions proposed in this alternative include:

- * Approximately 2,046 acres of burning in less dense stands is proposed. This was reduced from the 3,982 acres of Alternative 4 in the DEIS.
- * Mechanical cutting and piling of young trees would occur on about 1,250 acres.
- * Features common to All Action Alternatives that are applicable to burning and pre-commercial or small tree thinning treatments, mitigation and activities associated with the primary treatments are listed in this Chapter beginning on page 12.
- * Treatments proposed under this Alternative are consistent with the Forest Plan Visual Quality Objective standard.

The Gallatin Fringe Inventoried Roadless Area (IRA) would have prescribed burning but there would be no harvest in the IRA. The approximate duration of the proposed activities would be a 5-12 year timeframe. The location of treatment areas can be found on the Figure 2-3: Alternative 4 Map.

Change Between the Draft EIS and the Final EIS

Upon further analysis, the fire management specialists determined that about 2,000 acres proposed for prescribed burning in this alternative would not be feasible to burn. However, the effects analysis for several resource areas reflects the original 3,982 acres. The reason these acres would not be feasible includes some combination of eight factors described in more detail in the Fuels Report (Brickell 2007). An example of the factors include consideration of whether the risk and consequences of escape are acceptable when existing fuel load is high and pretreatment is limited to small tree removal. Another example is whether burning without pretreatment (harvest) to reduce potential fire intensity may cause greater mortality and stress to trees leading to greater fuel loading in the area. (Brickell, 2007) More discussion of this information is in the Fire/Fuels Report (Brickell 2007).

BOZEMAN CREEK MUNICIPAL WATERSHED PROJECT
ALTERNATIVE FOUR TREATMENT UNITS

Treatment Legend

- Partial Harvest
- Mechanical or Hand Thin
- Understory Burn in Timber Stand

Legend

- Stream
- Temporary Road
- Forest Road
- Paved Road
- Gallatin NF Boundary

0 kilometers 1
0 miles 1/2 1

Bozeman Creek
Hyalite Creek
City of Bozeman Lands
Langohr Campground

T3S R5E T3S R6E

Alternative 5

Alternative 5 is designed to improve the effectiveness of the project toward meeting the purpose and need for action while mitigating unacceptable impacts to scenery, watershed, and westslope cut throat trout. Design of this alternative also incorporates treatment areas in and near the wildland urban interface that were unintentionally left out of other alternatives or after additional analysis areas were determined to be strategically important to treat with respect to fire spread. Additionally this alternative makes revisions in treatment prescription and/or method where more accurate information enabled specialists to make more accurate treatment recommendations.

The actions proposed in this alternative include:

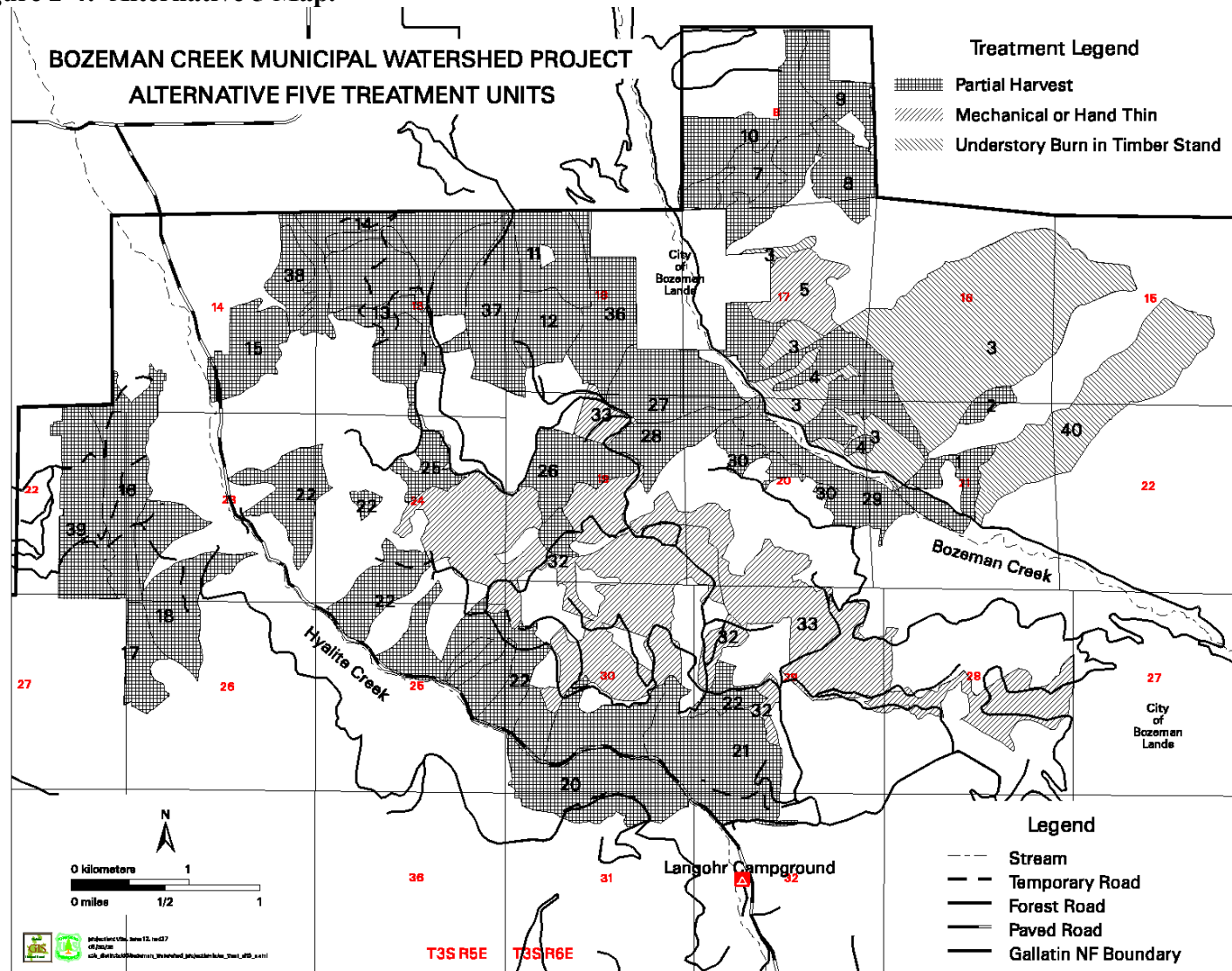
- * Approximately 950 acres of burning in less dense stands is proposed.
- * Mechanical cutting and piling of young trees would occur on 1,200 acres.
- * Partial harvesting is proposed for about 3,700 acres. Ground based (21%), skyline (12%) and helicopter harvest (67%) systems would be used to implement this thinning.
- * Features common to All Action Alternatives, mitigation and activities associated with primary treatments are listed in this Chapter beginning on page 12.
- * In this Alternative, the proposed treatments are consistent with the Visual Quality Objectives standard. However, in order to improve the existing condition from past activity, a project-specific Forest plan amendment would be required to change the Forest Plan visual quality objective (VQO) on the Gallatin Face (FP, pg. II-16) from Partial Retention to Rehabilitation specifically for the following two areas: the east side of Unit 13 where helicopter thinning would provide visual mitigation to an existing clearcut cable unit by visually breaking up the straight sides and upper road edge; and to the northwest edge of Unit 25 where tractor thinning would reduce the sharp edges and visual contrast of the leave strip between two existing clearcuts. A more detailed description of the treatment prescription and implementation methods is in Appendix A.

The location of treatment areas as modified can be found on the Figure 2-4: Alternative 5 Map.

The logging method for the units proposed for thinning large trees is approximately 21% ground based, 12% skyline harvest and 67% helicopter harvest.

Approximately 6.9 miles of temporary road would need to be constructed and 1.7 miles of old road re-opened. Approximately six hundred acres of the partial harvesting would occur in the Gallatin Fringe Inventoried Roadless Area. Harvest in the Inventoried Roadless Area would be accomplished by helicopter and no roads would be built. The approximate duration of the proposed activities would be a 5-12 year timeframe.

Figure 2-4: Alternative 5 Map.



Alternative 6

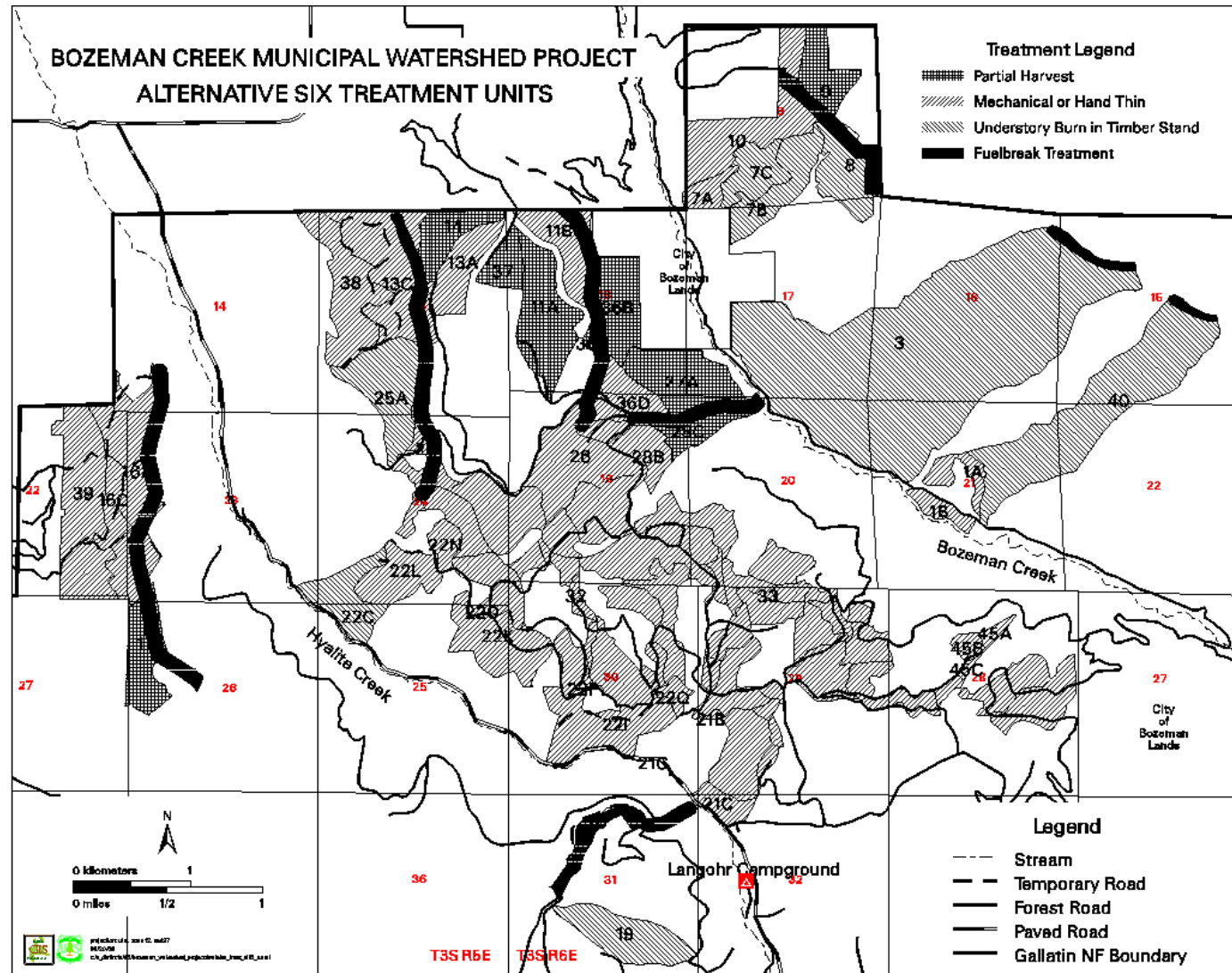
Alternative 6 was developed following the release of the DEIS and after the interdisciplinary team had an opportunity to examine new information on the costs of helicopter logging and also to review public comment on the alternatives. The purpose and need of reducing the risk of large scale, severe wildfire was still foremost, but the cost of the project had to be lowered and the primary way of doing that was to reduce the number of acres of helicopter logging. This was accompanied by an increase in prescribed burning, mostly inside the inventoried roadless area where helicopter thinning was reduced. Some public comment favored more prescribed burning and less mechanical thinning. Some comment also requested less thinning in the roadless area.

The actions proposed in this alternative include:

- * Approximately 1575 acres of burning in less dense stands is proposed.
- * Mechanical cutting and piling of young trees would occur on 1,100 acres.
- * Partial harvesting is proposed for about 2060 acres. Ground based (37%), skyline (24%) and helicopter harvest (39%) systems would be used to implement this thinning.
- * Features common to All Action Alternatives, mitigation and activities associated with primary treatments are listed in this Chapter beginning on page 12.
- * In this Alternative, the proposed treatments in four units are not consistent with the Visual Quality Objectives standard. These units are 16C, 22I, 38, and 36 D. These units will not meet the VQO standard of partial retention because the logging system is cable logging and the cable skid lines will be seen from different locations in the valley. Therefore, a site specific Forest Plan amendment would be needed to implement Alternative 6.

Approximately 7.1 miles of temporary road would need to be constructed and 3.1 miles of old road re-opened. Approximately 200 acres of the partial harvesting would occur in the Gallatin Fringe Inventoried Roadless Area. Harvest in the Inventoried Roadless Area would be accomplished by helicopter and no roads would be built. The approximate duration of the proposed activities would be a 5-12 year timeframe.

Figure 2-5: Alternative 6 Map.



Inventoried Roadless Area

A portion of the Gallatin Fringe Inventoried Roadless Area (IRA) contains treatment areas in all action alternatives. Alternative 6 proposes to helicopter thin approximately 200 acres in the IRA and prescribed burn 1329 acres. The following map shows the IRA and the location of the treatment areas.

Figure 2-6. Roadless Map.



Features Common to all Action Alternatives

The following description applies to all action alternatives. However, each alternative is unique in extent and/or emphasis on specific method.

The vegetative management activities identified for the alternatives are 1) burning in less dense stands of trees to reduce ground cover and smaller trees in order to keep the stands in an open condition with less chance of rapid fire spread; 2) mechanically or hand cutting, thinning, and piling smaller, younger trees to reduce the density of these kinds of stands; and 3) partially harvesting mature stands of trees, cutting smaller diameter trees, and leaving larger ones to reduce fuel loadings and break up the composition of vertical and horizontal fuels. Appendix A has a more detailed description of these treatments.

Types of activities associated with the primary treatments may include treatment of activity and natural fuels such as slashing, lop and scatter, handpiling, machine piling, whole tree yarding, yarding unmerchantable material, pile burning, jack pot pile burning, underburning, prescribed burning, erosion control actions, soil restoration activities, road construction, maintenance and closure, revegetation and weed control. This list is not an exhaustive list but is intended to share the range of activities associated with thinning and burning.

Changes between Draft EIS and Final EIS

The mitigation measure for units subject to re-entry standards in MA 11 was dropped. Management Area designations for the Hyalite face (Hodgeman and Leverich Canyons) were changed in 1990 by Forest Plan Amendment No. 3, to MA 5. Therefore, there is no MA 11 in the BMW project area, and thus, no need for re-entry timing restrictions.

The mitigation measure to retain all needle-free snags ($\geq 10''$ dbh and $\geq 18'$ tall) was dropped. In the time since this measure was written, there has been significant tree mortality due to insect infestations in the project area. Retaining all snags that meet the minimum size categories would defeat the purpose and need to reasonably reduce fuels within the municipal watershed. Snag retention measures for the project are specified below in Features Common to All Action Alternatives.

The following design features would be applied during implementation of the action alternatives.

Air Quality (Story 2007)

1. Within the minimum ambient distances the public will be warned about high smoke concentrations and advised not to travel outside of a vehicle or residence during the time of burning. Pile burn units would only be burned one unit at a time to avoid

- cumulative smoke effects between units. Smoke from the unit should be minimal when the next unit is burned.
2. The prescribed burns, underburns, and pile burns would be coordinated with the Montana/Idaho State Airshed Group (<http://www.smoke.org>).

Amphibian Species (Roberts 2007)

1. Adhere to the Wetland Executive Order 11990.
2. Retain a no-burn buffer of at least 50 feet adjacent to Bozeman Creek, Hyalite Creek or other perennial named and unnamed streams.
3. Ignite prescribed burns in a manner that would prevent head fires within riparian areas adjacent to ephemeral or intermittent draws. Ignition would not occur within these riparian areas, but fire would be allowed to back down hill and creep around.

Aquatic (Roberts 2007)

Design Features, Mitigation Measures, and Stewardship Opportunities

The following design features and mitigation measures are primarily related to sediment delivery. The following Stewardship opportunities if implemented would also improve sediment levels above and beyond what is already projected for Leverich Creek.

Stewardship Opportunities

1. Place 6 inch minus gravel mixture along eroding segments of the Leverich Canyon Road from the lower culvert to the top of the steep pitch just above the upper culvert; and associated drainage ditches;
2. Improve effectiveness of cross drainage structures along the Leverich Canyon Road from the lower culvert to the top of the steep pitch just above the upper culvert (Alternatives 5 and 6);
3. Replace the two failing small diameter culverts along the Leverich Canyon Road just below the upper culvert; and,
4. Surface the entire Leverich Canyon Road from the lower culvert to the top of the steep pitch just above the upper culvert.

Design Features and Mitigation Measures

1. A slash filter windrow would be installed below temporary road B-50, within the Leverich drainage, as needed. This mitigation affects about ¼ mile of road and is limited to the areas where soil movement could be directed to any water. The Forest hydrologist would identify the areas of concern;

2. No skidding down to FS Road # 3166 or jump up roads constructed from FS Road # 3166 up to treatment unit 13C within that portion of treatment unit 13C within the Leverich Creek drainage;
3. Implement the following three riparian treatment strategies to protect watershed and aquatic resource values: A) SMZ Guidelines; B) Modified SMZ Guidelines; and, C) No Cut or Treatment Buffers. The selected treatment strategy is dependent on location within the project area, proposed treatment type, and stream class (as defined by the Streamside Management Zone Laws and Rules (DNRC 2006)). See Appendix B for Best Management Practices and Streamside Management Zone and Modified Streamside Management Zone guidelines.

Heritage Resources (Allen 2006)

1. An archaeologist and the sale administrator would flag off the one known archeological site when work is in the vicinity to protect it from disturbance.
2. If any additional heritage assets should be encountered during the project, then disturbing actions would be halted immediately and an archaeologist contacted.

Invasive Weeds (Councilman 2007)

Based on suggestions and guidance in Clark (2003), USDA Forest Service, Guide to Noxious Weed Prevention Practices (2001), and Forest Service Manual 2080 a number of preventative actions would be implemented for this project.

1. To prevent the establishment and spread of weed infestations, include a timber sale contract provision or contract clause in all vegetation management contracts that includes washing of all wheeled or track type equipment that would be used off roads. Equipment would be washed prior to entry onto the National Forest.
2. Conduct activity area surveys and treatment of weeds before activities commence.
3. Identify and avoid areas infested where activities could spread weed seeds. Maintain weed-free equipment parking; helicopter refueling areas, equipment staging areas, log landings, and area roads. Monitor for and eradicate new weeds promptly.
4. Retain native vegetation in and around logging areas and minimize soil disturbance by adhering to soil best management practices.
5. Minimize the period from end of logging to contract closure, re-vegetation, and/or reforestation for long-term restoration (USDA Forest Service 2001).
6. Post project weed suppression notices on all activity areas.
7. Use only certified weed-free seed for rehabilitation of disturbed sites. Refer to local seeding guidelines for detailed procedures and appropriate mixes. Use native seed only. Re-vegetation may include planting, seeding, fertilization, and weed-free mulching as indicated by local prescriptions.

Effectiveness and financing: Washing vehicles is becoming common practice. Some studies indicate weed seeds are being removed from mechanized equipment and collected for disposal during weed washing (Wilson et. al 1999). The cost of washing equipment is no longer an item that is appraised for in timber sale appraisals. While there is no direct cost to the Government, we can assume the purchasers would reduce

their bids slightly to cover the cost of washing. This is not expected to be a measurable cost.

Range (Clark 2007)

1. Fences on the Bozeman- Hyalite divide or pasture fences between pastures in the Hyalite Canyon allotment would need to be protected during the fuels reduction treatments or they would need to be reconstructed. If fuels treatments open up natural boundaries on the Bozeman-Hyalite Divide, fences would need to be built to replace the natural boundaries. In the Project Record, a map is provided to show existing fences and natural boundaries.

Recreation (Cary 2007)

1. Bozeman Creek Trail/Road and Moser Creek Road would not both be closed at the same time. Restrict helicopter logging operations and hauling such that both major roads are not closed any one time during fuels management operations.
2. Post information at appropriate access points to inform the public of project activities. Provide local media with updates about project work that may affect the recreating public. Post warning signs notifying forest users of potential hazards from fuel treatment activities when occurring adjacent to dispersed areas, roads, and trails. If necessary, issue special orders (regulations) that temporarily close some areas or routes to protect the public.

Roadless (Cary 2007)

1. Select cut trees to generally small diameter in the Inventoried Roadless Area to minimize the immediate visual impact to naturalness and undeveloped character.
2. Minimize stump heights to 8" or less.

Scenery (Ruchman 2007)

1. Mark and thin the edges of all units that would be visible from key observation points in such a way so that unit boundaries are not easily discernible after the thinning work is accomplished. This means that no unit boundary edges visible from key observation points should be straight lines, especially adjacent to city or private land, where ownership boundaries are straight. In addition:
 - a. Where units border unthinned, dense forest land, the unit edges should be irregularly shaped and feathered to be predominantly natural appearing. Feathering means that a transition zone of uneven depth is created inside the unit along the boundary in which the percent of tree removal should be gradually decreased toward the unit boundary.

- b. Where units border meadow or very open forest, the percent of tree removal in the transition zone should be increased to visually tie into those naturally open areas.
2. Within all units, where possible, leave trees with full crowns, as individuals or in groups, to achieve the appearance of naturally open grown crowns.
3. Since the north edge of Unit 26 is very visible from the Gallatin Valley, create a zone of transition into the adjacent dense forest to its north and to the west of Unit 33.
4. In unit #1B along the southwest side of Bozeman Creek Trail, stumps should be cut as low as possible or angle cut away from viewers on the trail.
5. Where practical, all slash piles, decks and landings should be located out of sight in the foreground of key observation points and heavily used recreation corridors and areas. Where they cannot be located out of sight, they should be rehabilitated in such a way that after work is completed, they would not visually dominate the seen area.
6. Staging areas that are created by grading and flattening, or that receive enough use to compact soil or mix top and subsoil, and large burn piles that are visible from the Hyalite Road, Langohr Campground, the Bozeman Creek Trail, Forest Trails #428 or #435, should be recontoured to natural contours and seeded so that within one year of this rehabilitation work the site is fairly natural-appearing.
7. After thinning work is completed, those segments of temporary roads that are immediately visible and adjacent to FS roads and trails, especially FS Trail 428 and the Leverich Creek Trail #435, should be recontoured.
8. An emphasis will be placed on completing all slash burning and post thinning cleanup as soon as practical in those areas in the immediate foreground in key visual and heavily used recreation areas and corridors.
9. Fire control lines installed prior to burning will tie in, where possible, to existing opening and topographic features to create more natural looking burn patterns.

Monitoring Requirements

The Forest landscape architect or Forest silviculturalis will work with the presale forester to complete the following monitoring.

1. During marking of the units, monitoring should be done to ensure that trees with sufficient crowns are being left and that the mix between full crowned individuals and tree clumps marked to retain are achieving the appropriate transition from dense forest into thinned and open areas.

Soil (Shovic 2007, Keck 2009)

1. Gallatin National Forest Soils Best Management Practices (BMPs) would be incorporated in project design (Keck, 2009; Story, 2006b) in order to limit detrimental disturbance associated with implementation. Appendix B provides a listing of Best Management Practices.
2. In units with previous harvest or temporary road construction that would exceed the 15% detrimental soil disturbance regional soil standard, restoration procedures will be applied to ameliorate past disturbances. The restoration actions will be sufficient to reduce the effects of previous harvest. Tables in the Soils section in Chapter 3 estimate the amount of restoration per alternative.

Monitoring Requirements

To verify the predictions used in this analysis, and to provide information for future work, soil quality monitoring will be conducted by the Forest Soil Scientist on selected harvest units where tractor-based harvest systems were used. Monitoring procedures will follow the current Forest Soil Disturbance Monitoring Protocol (Page-Dumroese, et.al. 2009). Harvest units selected for detailed sampling will be determined based on the professional judgment of the Forest Soil Scientist. An initial assessment will be made one year after harvesting and follow-up monitoring conducted five years after harvest. In addition, monitoring will be undertaken on a representative sample of burn units to test predictions of burning effects at both the one year and five year intervals after treatment.

Water Quality (Story 2007)

- 1) Retain a no-burn buffer of at least 50' for burn treatment areas adjacent to Bozeman Creek, Hyalite Creek, and perennial tributaries.
- 2) Apply standard BT timber sale protection clauses to the commercial harvest activities to protect against soil erosion and sedimentation. Include standard BMP's for all activities including Montana Streamside Management Act compliance rules.
- 3) Apply BMP's for Forestry in Montana (DNRC, 2004). These are incorporated into Appendix B.
- 4) A slash filter windrow would be installed below temporary road B-50, within the Leverich drainage, as needed. This mitigation affects about ¼ mile of road and is limited

to the areas where soil movement could be directed to any water. The Forest hydrologist would identify the areas of concern (Alternative 5 and 6).

The Gallatin Forest Plan, Forest Wide Standards 10.2 (page II-23) requires that Best Management Practices (BMP's) will be used in all Forest watersheds. The Montana Forestry BMP's are included in Appendix BMP, which is required to be followed in all timber harvest and road construction activities. Forest Plan Direction A.5 (page II-1) requires the Gallatin NF to meet or exceed State of Montana water quality standards.

Monitoring and Monitoring Requirements

Water Quality/BMP's

At least 1 BMP review will be conducted for some of the thinning and prescribed burn units as well as for some the temporary road segments. The BMP review team will use the Montana BMP audit forms augmented by the additional BMP's and EA required mitigation for the Bozeman Municipal Watershed Project. The objective of the BMP review is to document BMP and SMZ rule compliance and to validate the erosion and water quality effects predicted by examination soil erosion, runoff and water quality response, and re-vegetation of prescribed burns. A BMP review report, including observations and recommendations, will be prepared by the Gallatin NF Hydrologist and submitted to the Bozeman District Ranger.

Wildlife (Dixon 2008)

Northern Goshawk Nest Protection

- No treatment activity within a minimum buffer of 40 acres around known occupied goshawk nest trees.
- No ground-disturbing activities within known occupied post-fledging areas (PFA) from 15 April through 15 August. The PFA is an area of roughly 420 acres surrounding an active nest site.
- To further minimize disturbance within the PFA for an occupied nest, establish a "no-fly zone", 2,000 feet in all directions including above the nest, for the period of 15 April through 15 August.
- Adapt thinning prescriptions in treatment units closest to known, occupied nest sites so that the proportion of closed canopy ($\geq 50\%$ canopy cover) habitat in an estimated goshawk home range is within the range of habitat conditions (37-69%) reported in the Northern Region Overview for goshawks.

Bald Eagle Nest Protection

From the National Bald Eagle Management Guidelines; Category C. Timber Operations and Forestry Practices (USDI 2007:13)

- Avoid removal of overstory trees within 330 feet (100 m) of an active nest at any

- time of the year
- Avoid timber harvest operations, including road construction and chain saw and yarding operations, during the breeding season (1 Feb – 15 August [GYBEMP 1995:24]) within 660 feet (200 m) of an active nest.
 - Selective thinning and prescribed burning should not occur during the breeding season within 660 feet (200 m) of an active nest.

Grizzly Bear

- Within the Inventoried Roadless Area (IRA), helicopter logging must be completed in the winter denning season or limited to one non-denning (March 1 to Nov. 30) season (FWS, Biological Opinion; Terms and Conditions).
- Manage the schedule for completion of all helicopter logging to be completed in as few days as possible. Track the number of helicopter logging flight days and reinitiate conlustaion if the operations exceed a total of 144 days for the duration of the project (USFS, Biological Assessment; FWS, Biological Opinion; Terms and Conditions).
- Use Broadcast burning to treat slash post-harvest to promote regeneration of vegetative cover in all helicopter units (which includes all the treatment occurring within the Inventoried Roadless Area (USFWS Biological Opinion; Conservation Recommendations) (NOTE: To meet the purpose and need for the project, within the ground-based units, slash may be piled and burned).
- All activities associated with project implementation will be in compliance with Forest-wide Food Storage Order requirements.
- Roads constructed for project activity should be designed with minimum handbook standards necessary to accomplish the task, temporary in nature, and effectively gated to restrict public motorized use. Once the activity is complete, these roads should be permanently and effectively closed and re-vegetated. (GNF Travel Management Plan FEIS, Detailed Description of the Alternatives, Chapter 1-31; also supported by the USFWS Biological Opinion; Conservation Recommendations).

Big Game

- Maintain at least two thirds of the hiding cover associated with key habitat components such as wet sites, wallow and mineral licks. (Gallatin Forest Plan p. II-18)

Snag Retention

Forest Plan standard for snag retention is: leave an average of 30 snags (≥ 18 feet tall and ≥ 10 " dbh) per 10 acres within harvest units. In addition, for Douglas fir and subalpine fir on rocky or shallow soils, designate 60 live trees per 10 acres as replacement trees for snags. Trees and snags with obvious large nest structures or

cavities should be left intact, with immediately surrounding vegetation retained to provide security cover. (Gallatin Forest Plan Amendment No. 15)

In addition to Forest Plan standards, the following snag retention prescriptions will be followed:

- Where existing snags would be removed for safety concerns, consider leaving the snag(s) in a clump of live trees to meet snag retention objectives.
- **Snag Retention Prescriptions by Forest Cover Type:**
 - Douglas fir dominant:* minimum of 40 snags ($\geq 10''$ dbh) per 10 acres, with at least 20 larger ($\geq 15''$ dbh) snags per 10 acres
 - Lodgepole pine dominant:* minimum of 50 snags ($\geq 10''$ dbh) per 10 acres.
- If site conditions do not provide adequate snags at the time of project implementation, or if snags must be removed for safety reasons so that the above conditions cannot be met, apply one of the following measures:
 1. Retain live replacement trees in the appropriate snag size category for the vegetation type. Leave at least twice as many live replacement trees as the number of snags recommended for the vegetation type.
 2. Create snags by killing trees after harvest is complete, striving for the number and size class listed above by vegetation type.

Monitoring Requirements

- Survey treatment units upon completion of prescriptions. If site conditions do not provide adequate snags after project implementation; i.e. if the above snag retention prescriptions are not met, then either ensure that there are at least twice as many live replacement trees as the number of snags recommended for the vegetation type, or if snags are completely absent in post treatment units, create snags by killing trees after harvest is complete, striving for the number and size class listed above by vegetation type.

Sensitive Plants

Should sensitive plant species be found in any proposed treatment units or associated with any proposed access features (e.g. project roads, helicopter landings), plant populations will be protected with area and/or timing restrictions. This measure is consistent with direction for management of sensitive species (FSM 2670).

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the Proposed Action provided suggestions for alternative methods for achieving the purpose and need. Some of these alternatives may have been outside the scope of Bozeman Municipal Watershed Project, duplicative of the alternatives considered in detail, or determined to be components that would cause unnecessary

environmental harm. Therefore, four alternatives were considered, but dismissed from detailed study for reasons summarized below.

Scoping Alternative

This alternative was the original proposal presented by the Forest Service for the initial scoping effort. (GNF, 9/2005) It was developed to achieve the purpose and need outlined in Chapter 1 of the EIS. Fuel reduction activities being considered included treating up to 6,000 total acres, including a small portion of the Gallatin Divide Inventoried Roadless Area in the Bozeman Creek watershed, and treating up to 3,000 acres in the Hyalite Creek watershed with a combination of prescribed burning, thinning, brush cutting, and commercial tree harvest. This proposal was a broad description for the area proposed for treatment and the types of treatments. It was the starting point from which Alternative 2-5 were developed. Alternative 2 is the detailed description of this conceptual alternative and was considered in detail.

Water Treatment Facility Improvements Alternative

During scoping, comments were submitted that asked the Forest Service to consider an alternative that improved water treatment facilities such as building sediment traps, upgrades to treatment plant, and wells. The intent was to focus mitigation on the City facilities to address the purpose and need rather than National Forest System (NFS) lands. The recommendations were shared with the City of Bozeman for consideration. These options are not within the decision authority for the Forest Service so this alternative is not within the scope of the decision. The City of Bozeman is considering upgrades to water management system and the suggestions provided by the public were forwarded to the City staff.

The City commissioned a facility plan evaluation of the treatment plant with the long term potential to convert from direct filtration to conventional or membrane filtration. The City of Bozeman Water Facility Master Plan (City of Bozeman, 2006) http://www.bozeman.net/bozeman/engineering/documents/Water_Facility_Plan.pdf contains an extensive analysis of potential water treatment upgrade alternatives. The Bozeman City Commission endorsed the Facility Master Plan preferred alternative, which is the construction of 22 million gallons per day filtration plant ultimately expandable to 36 million gallons per day. A raw water storage pond, which could be used to store up to a week of water in case wildfire compromised raw water quality, was not endorsed by the City of Bozeman due to excessive cost and doubts as to the effectiveness of such a raw water storage pond in the event of a major forest fire. The Water Treatment plant will initiate pilot testing of the membrane filter technology during 2007 with the goal of construction of the membrane filtration plant in 5-6 years.

In discussions with the City of Bozeman Water Treatment Plant personnel, the upgrading of the Water treatment plant will allow better filtering of pathogens and sediment but could still have operational problems during periods of high turbidity such as an intense rain event after wildfire. The treatment plant upgrade will not alleviate the need for reduction of wildfire potential in the source area watersheds - Bozeman Creek and

Hyalite Creek. The City acknowledges it will have to consider several operational changes in the event of a fire within the watershed, based on the location and severity of the fire. The City is also considering the diversification of water sources as well as other water system improvements that will fit with their need to expand and protect their water source.

The purpose of the Bozeman Municipal Watershed Project is to begin reducing the potential severity and extent of future wildland fires in the watershed and begin creating vegetative and fuel conditions that would reduce the risk of excess sediment and ash reaching the municipal water treatment plant in the event of a wildfire. The role the Forest Service has is to manage NFS lands in a way that minimizes the risk of excessive sediment, ash or other contaminants reaching the facility from NFS lands.

While the City of Bozeman and the Forest Service are working together, each entity has a unique role. The Gallatin NF does not have jurisdiction on City of Bozeman water system operations.

Wildland Fire Use Alternative

During scoping the Forest Service was asked to consider an alternative that needed little investment such as fire use.

Currently the project area is within Fire Management Unit #3 Gallatin Protection in the Gallatin National Forest Fire Management Plan. This FMU is designated Interface/Intermix meaning WUI, Municipal Watershed, campground, dispersed recreation and heavy public use. Wildland Fire use is not an Appropriate Management Response (AMR) option based on the 1987 GNF FP FEIS and the values at risk. .

According to the Gallatin National Forest Plan (1987) the Management areas (MA) in the project area identifies fire suppression as the Appropriate Management Response. The Forest can utilize 'contain' and 'confine' strategies relative to wildland fire before and after fire season (May 1 to Sept 30). Otherwise, during fire season the AMR is control. Human caused ignitions would require a control strategy, unless safety to firefighters or values at risk allow for safer strategies/tactics, and cost considerations. Planned ignition (RX fire) is an option open to the area and is under consideration where appropriate.

Wildland Urban Interface Alternative

During scoping the Forest Service was asked to consider fuel reduction treatment only in the Wildland Urban Interface immediately around homes. Treatment in the WUI could easily be considered in a stand alone decision tiered to the current analysis. However, the purpose and need for action is primarily around protection of the Bozeman Municipal Water Treatment Plant and reducing the risk to the Municipal Watershed. Elimination of treatment outside of the WUI would not meet the purpose and need defined for this effort.

Comparison of Alternatives

This section provides a comparison Alternatives in four tables. Table 2.1 Actions Proposed for each Alternative, Table 2.2 Comparison of Measures of Fire Behavior, Fire Size and Probability related to the Purpose and Need for Action, Table 2.3 How well the Alternatives would meet the Purpose and Need for Action, Table 2.4 Comparison of Issues by Alternative that would be Factors in the Decision. Information in Table 2-4. Comparison of Issues is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives. These are the issues that would be factors in the decision.

Table 2-1. Actions Proposed for each Alternative

Alternative	Acres			Miles
	Mechanical thin of small trees less than 6" in diameter, pile and burn	Prescribed burn	Partial harvest by mechanied thin trees over 7" in diameter.	Temporary Road Construction
Alternative 1 (No Actions)	0	0	0	0
Alternative 2 (Proposed Action)	1150	850	1926	7.2
Alternative 3	1150	1100	3621	13.5
Alternative 4 (Prescribed burn/No logging or roads Alternative)	1250	2046	0	0
Alternative 5 (DEIS Preferred Alternative)	1156	950	3708	6.9
Alternative 6 (FEIS Preferred)	1117	1575	2045	7.1

Acres proposed for partial harvest that are determined to be unsuitable due to difficult terrain or lack of commercial value would be considered for thinning and piling of the trees less than 7 inches in diameter. The variation in acreage is due to the large unit size. Within the proposed units there is variation in terrain and vegetation type, density, and size.

Table 2.2: Measures of Fire Behavior, Fire Size and Fire Probability Related to the Purpose and Need for Action. See Fuels Section in Chapter 3 for more detail.

Measure & Desired Condition	Outcome	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4 Prescribed Burn/No Logging or Roads	Alternative 5 DEIS Preferred Alternative	Alternative 6 FEIS Preferred Alternative
Fuel Model Conversion From Fuel Model 10 to 8 or 184.	Crown fire potential is reduced. Fire behavior in FM184 /8 is expected to have lower flame lengths and spotting distance is reduced.	0 acres	3239 acres	5176 acres	1571 acres	4743 acres	3647 acres

Table 2.2: Measures of Fire Behavior, Fire Size and Fire Probability Related to the Purpose and Need for Action. See Fuels Section in Chapter 3 for more detail.

Measure & Desired Condition	Outcome	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4 Prescribed Burn/No Logging or Roads	Alternative 5 DEIS Preferred Alternative	Alternative 6 FEIS Preferred Alternative
Crown Fire Potential Acres with fuel treatments that alter the expected fire type from crown fire to surface fire. The acres in this row indicate a reduction in crown fire potential so a higher number is desirable.	Surface fire indicates less severe and less intense fire. The potential extent of fire is reduced if surface fire conditions are maintained. These fires can be more effectively suppressed and they pose less risk to safety.	0 acres	3239 acres	5176 acres	2046 acres	4743 acres	3642 acres

Table 2.2: Measures of Fire Behavior, Fire Size and Fire Probability Related to the Purpose and Need for Action. See Fuels Section in Chapter 3 for more detail.

Measure & Desired Condition	Outcome	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4 Prescribed Burn/No Logging or Roads	Alternative 5 DEIS Preferred Alternative	Alternative 6 FEIS Preferred Alternative
Potential Fire Size ¹	<p>These measures indicate potential fire severity and extent of fire.</p> <p>The highest reduction in % potential fire size and % of crown fire indicate less severe effects since a more surface fire is expected to burn.</p>	2278 acres	1462 acres	950 acres	1929 acres	957 acres	1041 acres
85 th weather percentile		7670 acres	5151 acres	3943 acres	5939 acres	3693 acres	3795 acres
97 th weather percentile							
The lowest potential fire size is most desirable.							
% Reduction in potential fire size		0%	33-36%	49-58%	15-23%	52-58%	51-54%
% Reduction in crown fire		0%	39-54%	56-70%	30-32%	59-70%	56-74%

¹ This estimate is relative to the expected/modeled fire size indicated for this alternative.

Table 2.2: Measures of Fire Behavior, Fire Size and Fire Probability Related to the Purpose and Need for Action. See Fuels Section in Chapter 3 for more detail.

Measure & Desired Condition	Outcome	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4 Prescribed Burn/No Logging or Roads	Alternative 5 DEIS Preferred Alternative	Alternative 6 FEIS Preferred Alternative
Probability of stand replacement crown fire. The higher the (-) number the better.	These number show a reduction in fire intensity and severity, extent of fire and undesirable spread.	6-7% Bozeman Creek 8-9% Hyalite Creek	-7% -32%	-22% -32%	-10% -29%	-11% -33%	-11% -33%
Flame length (FL) Overall range of flame length. Lower numbers are desirable. Average flame length FL of less than 4 foot are most desirable to enable direct effect fire suppression and lower risk to firefighters.	Lower flame lengths enable effective fire suppression and are indicate a safer environment for firefighters and the public.	0-63 feet 3-5 feet	0-27 feet 3-4 feet	0-29 feet 2 feet	0-43 feet 2 feet	0-19 feet 1.5 feet	0-35 feet 2 feet

Table 2.3 Comparison of Issues by Alternative that would be Factors in the Decision

Issue and Measure²	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4 Prescribed burn/No logging or Roads	Alternative 5 (DEIS Preferred)	Alternative 6 (FEIS Preferred)
Water Quality³ (Projected sediment in % over natural) (The Forest Plan (FP) standard allows no more than 30% over natural)	Meets FP Standards in All drainages.	Meets FP Standards in All drainages.	Does Not Meet FP Standards in All drainages	Meets FP Standards in All drainages.	Meets FP Standards in All drainages.	Meets FP Standards in all drainages.
Hyalite Drainage	5.8%	7.8%	10.0%	7.1%	7.6%	7.1%
Bozeman Creek Drainage	7.9%	10.7%	12.2 %	10.6%	11.2%	10.8%
Leverich Drainage	8.4%	33.2%	34.9%	14.8%	12.0%	10.3%

² The Fire and Fuels Issue is disclosed in Table 2.2 and 2.3 when comparing the purpose and need for action.

³ Sediment yield as measured percent over natural in tons/year modeled sediment in Bozeman, Hyalite, and Leverich Creek's is a management indicator for water quality.

Table 2.3 Comparison of Issues by Alternative that would be Factors in the Decision

Issue and Measure²	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4 Prescribed burn/No logging or Roads	Alternative 5 (DEIS Preferred)	Alternative 6 (FEIS Preferred)
Westslope Cutthroat Trout Habitat in Leverich Creek ⁴	Meets FP Standard	Meets FP Standard	Does not meet FP standard	Meets FP Standard	Meets FP Standard	Meets FP Standard
Compliance with Forest Plan Standards and the Memorandum of understanding for the Conservation Agreement(MOUCA)	Meets the intent of the MOUCA	Does not meet the intent of the MOUCA	Does not meet the intent of the MOUCA	Meets the intent of the MOUCA	Meets the intent of the MOUCA	Meets the intent of the MOUCA

⁴ 1. Percent over Natural (or Reference) Sediment Delivery rates compared to the standard established for Class A streams. Meeting the standard would assure that the 90% spawning habitat management objective is being achieved. (FP standard)

2. Meet the intent of Implementation Strategy for Memorandum of Understanding and Conservation Agreement (MOUCA) for Westslope Cutthroat Trout in Montana by protecting all pure and slightly introgressed (90% or greater purity) westslope cutthroat trout populations and ensuring the long-term persistence of westslope cutthroat within their native range (Powell 2002). Because Leverich Creek is the only project area stream that contains westslope cutthroat trout, this indicator only applies to this watershed.

Table 2.3 Comparison of Issues by Alternative that would be Factors in the Decision

Issue and Measure²	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4 Prescribed burn/No logging or Roads	Alternative 5 (DEIS Preferred)	Alternative 6 (FEIS Preferred)
Scenery – Do the treatments meet Forest Plan Visual Quality Objectives (VQO)? ⁵	Yes	Yes, except 5 units	Yes, except 10 units	Yes	Yes Treatments would improve the exiting scenery condition near units 13 and 25.	Yes, except for 4 units
Are wilderness attributes maintained?	No impact	Yes, but there would be short term impact to solitude and primitive recreation opportunities.	Yes, but there would be short term impact to solitude and primitive recreation opportunities.	Yes, but there would be short term impact to solitude and primitive recreation opportunities.	Yes, but there would be short term impact to solitude and primitive recreation opportunities.	Yes, but there would be short term impact to solitude and primitive recreation opportunities.

⁵ The indicator for measuring potential effects to the scenery resource is the assigned Forest Plan standard for visual quality (Visual Quality Objective) that applies to each area where fuel reduction is being proposed. This is discussed in detail in Chapter 3, in the Scenery section on Applicable Laws, Regulations, Policy and Forest Plan Direction.

Table 2.3 Comparison of Issues by Alternative that would be Factors in the Decision

Issue and Measure²	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4 Prescribed burn/No logging or Roads	Alternative 5 (DEIS Preferred)	Alternative 6 (FEIS Preferred)
Acres of Gallatin Fringe IRA that would be impacted.	0 acres 0 acres	681 acres of prescribed burning 468 acres of partial harvest	895 acres of prescribed burning 738 acres of partial harvest	1147 acres of prescribed burning 0 acres of partial harvest	941 acres of prescribed burning 666 acres of partial harvest	1139 acres of prescribed burning 200 acres of partial harvest

Table 2.3 Comparison of Issues by Alternative that would be Factors in the Decision

Issue and Measure²	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4 Prescribed burn/No logging or Roads	Alternative 5 (DEIS Preferred)	Alternative 6 (FEIS Preferred)
Effects to unroaded lands Naturalness Undeveloped character Primitive recreation opportunities Special features Manageability	No impact	Short term effects to natural processes, undeveloped character from vegetation activities Potential long term effects to natural processes, undeveloped character from 2 mi of temporary road construction. No effect on manageability	Short term effects to natural processes, undeveloped character from vegetation activities Potential long term effects to natural processes, undeveloped character from 2.75 mi of temporary road construction. No effect on manageability	Short term effects to natural processes, undeveloped character from vegetation No long term effects to natural processes. No effect on manageability	Short term effects to natural processes, undeveloped character from vegetation Potential long term effects to natural processes, undeveloped character from 2.75 mi of temporary road construction. No effect on manageability	Short term effects to natural processes, undeveloped character from vegetation Potential long term effects to natural processes, undeveloped character from 2.25 mi of temporary road construction. No effect on manageability
Canada Lynx – Would treatments meet the direction in the Northern Rockies Lynx Amendment? ⁶	Yes	Yes, with proper documentation.	Yes, with proper documentation.	Yes, with proper documentation.	Yes, with proper documentation.	Yes, with proper documentation

⁶ The standards in the Northern Rockies Lynx Amendment are tied to habitat standards for denning, foraging and amount of unsuitable habitat. These standards and potential impacts are discussed in Chapter 3 in the Canada Lynx section.

Table 2.3 Comparison of Issues by Alternative that would be Factors in the Decision

Issue and Measure²	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4 Prescribed burn/No logging or Roads	Alternative 5 (DEIS Preferred)	Alternative 6 (FEIS Preferred)
Northern Goshawk	Not impacted	Least impacted of the action alternatives.	More impacted than action Alternatives 2 & 4.	Less impacted than Alternative 3 & 5	Most impacted	Less impacted than Alternative 3 & 5
Does the Alternative meet the habitat guidelines? ⁷	Yes	Yes	Yes	Yes	Yes	Yes

⁷ The Northern Goshawk section in Chapter 3 discusses the potential effects and habitat guidelines in detail.